REMARKS

Applicant is in receipt of the Office Action mailed May 17, 2007. Claims 1, 4, 5, 6, 8, 9, 11, 18, 19, 20, and 21 have been amended. Claim 17 has been cancelled. Thus, claims 1-16, and 18-21 are pending in the case. Reconsideration of the present case is earnestly requested in light of the following remarks.

Amendments

Applicant has amended the independent claims to include the subject matter of claim 17, and most of the subject matter of claim 18. Applicant has also amended claims 19 and 20 to make the subject matter of these claims statutory under section 101. Applicant believes that the claims as currently written are patentably distinct and non-obvious over the cited art, and are also statutory, and are thus allowable.

Applicant has also amended the claims to replace the claim conjunction "and" with "or", per recent judicial interpretations of claim language.

Section 101 Rejections

Claim 21 was rejected under 35 U.S.C. 101 as being directed to non-statutory matter, specifically for being "drawn to a computer program per se". Applicant respectfully disagrees, and notes that claim 21 is directed to a method, and has been amended as indicated above to stipulate that the claimed method is computer-implemented. Moreover Applicant respectfully submits that the method of claim 21 as currently amended clearly performs multiple actions, and produces a tangible result, specifically, synchronization of a plurality of devices.

In the Response to Arguments, the Office Action asserts that synchronizing multiple devices in a system is not itself a tangible result, and that the claim must indicate the particular type of system claimed to be statutory under section 101. Applicant respectfully disagrees, noting that there is no statutory requirement to specifically identify the particular application domain for an invention, and that the claimed systems and techniques for synchronizing multiple devices are themselves novel and useful, and produce a tangible result, specifically, a plurality of synchronized devices, which are useful in many different application domains.

Removal of the section 101 rejection of claim 21 is respectfully requested.

Applicant further notes that claim 19, originally directed to an application programming interface (API), is now directed to a system that implements the API, and is thus statutory under section 101.

Section 102 Rejections

Claims 1 and 21 were rejected under 35 U.S.C. 102(e) as being anticipated by Conway et al. (USPUB 2004/0064750, "Conway"). Applicant respectfully disagrees.

Amended Claim 1 recites:

1. A memory medium that stores program instructions implementing an application programming interface (API) for synchronizing multiple devices in a system, wherein the API comprises:

a plurality of functions invocable in a program to synchronize a plurality of devices, wherein each function is executable to perform a respective functionality related to synchronizing the plurality of devices, and wherein at least one of the plurality of functions is executable to access a plurality of instrument drivers corresponding respectively to the plurality of devices to synchronize the plurality of devices;

wherein, in synchronizing the plurality of devices, the at least one of the plurality of functions is executable to:

query each of the plurality of devices to determine a trigger clock signal for each of the plurality of devices based on one or more of:

a common sample clock;

a common reference clock; or

a specified minimum trigger clock period; and

synchronize the plurality of devices based on the determined trigger clock signals, wherein, in synchronizing the plurality of devices based on the determined trigger clock signals, the at least one of the plurality of functions is executable to:

equalize phase of the common sample clock and/or the common reference clock of each of the plurality of devices;

equalize phase of the trigger clock signals of each of the plurality of devices; and

condition driving and/or reception of triggers on trigger enable signals generated from the trigger clock of each of the plurality of devices.

Nowhere does Conway disclose **an application programming interface (API) for synchronizing multiple devices in a system, wherein the API comprises: a plurality of functions invocable in a program to synchronize a plurality of devices, wherein each function is executable to perform a respective functionality related to synchronizing the plurality of devices, and wherein at least one of the plurality of functions is executable to access a plurality of instrument drivers corresponding respectively to the plurality of devices to synchronize the plurality of devices**, as recited in claim 1.

In asserting that Conway discloses these features of claim 1, the Office Action cites paragraphs [0007] – [0009] of Conway, which read thusly:

> [0007] The instrumentation hardware may be configured and controlled by software executing on the computer system. The software for configuring and controlling the instrumentation system typically includes driver software and the instrumentation application software, or the application. The driver software serves to interface the instrumentation hardware to the application and is typically supplied by the manufacturer of the instrumentation hardware or by a third party software vendor. The application is typically developed by the user of the instrumentation system and is tailored to the particular function that the user intends the instrumentation system to perform. The instrumentation hardware manufacturer or third party software vendor sometimes supplies application software for applications that are common, generic, or straightforward.
>
> [0008] Instrumentation driver software provides a high-level interface to the operations of the instrumentation device. The instrumentation driver software may operate to configure the instrumentation device for communication with the host system and to initialize hardware and software to a known state. The instrumentation driver software may also maintain a soft copy of the state of the instrument and initiated operations. Further, the instrumentation driver software communicates over the bus to move the device from state to state and to respond to device requests.

> [0009] Some computerized instrumentation systems include several instrumentation and/or DAQ devices. Each device may generate and/or capture data based on a sample clock. For example, the sample clock on an arbitrary waveform generator may drive a DAC. Two or more devices may be considered to be digitally synchronized when their data capture and/or data generation circuits line up within a sample clock cycle. Digital synchronization may occur when the sample clocks of each device to be synchronized have substantially the same frequency (e.g., the devices' sample clocks may experience instantaneous frequency differences but, on average, the devices' sample clocks may not drift relative to each other). In addition, for digital synchronization, the devices to be synchronized are preferably able to respond to a trigger within the same sample clock period, and in the case of output devices, to output their data to a connector at substantially the same time. As described herein, two clocks are in phase when they are measured as having substantially the same frequency and substantially zero degrees of phase difference.

As the above paragraphs make clear, in prior art approaches to device synchronization, application programs, e.g., written by the user, make calls to respective instrumentation drivers to interact with the respective devices, e.g., to coordinate synchronization among devices. Note that the application program must make individual calls to each respective instrument driver to interact with the respective device, and so to synchronize multiple devices, the application must make corresponding multiple (direct) calls to the respective instrument drivers of the devices. Thus, there are two software layers involved in synchronization of the devices—the application layer, and the driver layer.

In direct contrast, the present application describes an API (comprising a plurality of functions) as an intermediate software layer interposed between the application layer and the driver layer, where, as claimed, the program (application) makes calls to the functions of the API, and these functions access the drivers. Moreover, as recited in the claim, at least one of the functions "is executable to access a plurality of instrument drivers corresponding respectively to the plurality of devices to synchronize the plurality of devices". In other words, rather than having to access each instrument driver individually via a respective function call as per the prior art, all of the instrument drivers of the plurality of devices are accessed via a single function call (the at least one of the functions) to synchronize the devices. Thus, the addition of this intervening layer (i.e.,

the present API) significantly simplifies synchronization of multiple devices, which provides a great benefit over prior art approaches to multiple device synchronization.

Nowhere does Conway, in the cited paragraphs or elsewhere, teach or suggest such an API, nor, more specifically, such an *API function that is executable to access multiple instrument drivers to synchronize the plurality of devices.* In fact, Conway makes no mention whatsoever of an API function that accesses a plurality of device drivers.

Thus, for at least these reasons, Applicant submits that Conway fails to teach or suggest this feature of claim 1.

Nor does Conway disclose **wherein, in synchronizing the plurality of devices, the at least one of the plurality of functions is executable to: query each of the plurality of devices to determine a trigger clock signal for each of the plurality of devices based on one or more of: a common sample clock; a common reference clock; or a specified minimum trigger clock period**, as recited in claim 1.

Cited paragraph [0016] reads:

> [0016] Various embodiments of a method and system for synchronizing trigger reception and generation on different instrumentation devices may involve each instrumentation device generating one or more trigger enable signals and delaying receipt (or driving) of a trigger signal until a transition (e.g., a rising or falling edge) in a trigger enable signal. In one embodiment, an instrumentation system may include several instrumentation devices and a communication medium (e.g., a bus) coupling the instrumentation devices. One of the instrumentation devices may process data in response to a sample clock signal. The sample clock signal may be generated by that instrumentation board from a reference clock signal. That instrumentation device may generate a trigger enable signal and delay performance of an operation in response to a trigger signal transmitted via the communication medium until a transition in the trigger enable signal. The trigger enable signal is not the sample clock signal. The trigger enable signal may be synchronized to another trigger enable signal generated by another one of the instrumentation devices.

As may be seen, the cited text discloses, in Conway, each device generates trigger enable signals that may be synchronized with another device's trigger enable signal, and

each device delays performance of an operation until there is a transition in the trigger enable signal, where the trigger enable signal is not a sample clock signal for the device.

Nowhere does the cited text (or Conway in general) describe an API function querying each of the plurality of devices to determine a trigger clock signal for each of the plurality of devices based on a common sample clock, a common reference clock, and/or a specified minimum trigger clock period.

Thus, for at least these reasons, Applicant submits that Conway fails to teach or suggest this feature of claim 1.

Nor does Conway disclose **synchronize the plurality of devices based on the determined trigger clock signals, wherein, in synchronizing the plurality of devices based on the determined trigger clock signals, the at least one of the plurality of functions is executable to: equalize phase of the common sample clock and/or the common reference clock of each of the plurality of devices; equalize phase of the trigger clock signals of each of the plurality of devices; and condition driving and/or reception of triggers on trigger enable signals generated from the trigger clock of each of the plurality of devices**, as recited in claim 1.

As discussed above, cited paragraph [0016] discloses that each device generates trigger enable signals that may be synchronized with another device's trigger enable signal, and each device delays performance of an operation until there is a transition in the trigger enable signal, where the trigger enable signal is not a sample clock signal for the device.

Nowhere does the cited text (or Conway in general) describe synchronizing a plurality of devices based on the determined trigger clock signals by executing an API function to equalize phase of the common sample clock and/or the common reference clock of each of the plurality of devices, equalize phase of the trigger clock signals of each of the plurality of devices, and condition driving and/or reception of triggers on trigger enable signals generated from the trigger clock of each of the plurality of devices.

Applicant notes that while paragraph [0041] of Conway discloses configuring clock generation circuits on devices "so that each device's sample clock is in phase with the sample clocks of the other devices", Conway makes no mention of *an API function*

that is executable to equalize phase of the common sample clock and/or the common reference clock of each of the plurality of devices, as well as equalize phase of the trigger clock signals of each of the plurality of devices, and condition driving and/or reception of triggers on trigger enable signals generated from the trigger clock of each of the plurality of device.

For example, Applicant notes that paragraph [0058] discloses using "a device that can measure the phase difference between any two or more of the devices", e.g., "an external oscilloscope, a PXI digitizer (e.g., located in the same chassis as the devices 100 whose TClk signals are being measured), or any other device or combination of devices that can perform such a measurement", and adjusting the phase of each TClk signal to synchronize the devices (with respect to TClk). Again, no mention is made of an API function executable to equalize phase of the common sample clock and/or the common reference clock of each of the plurality of devices, equalize phase of the trigger clock signals of each of the plurality of devices, and condition driving and/or reception of triggers on trigger enable signals generated from the trigger clock of each of the plurality of devices. In fact, paragraph [0064] discloses using dedicated digital circuitry in each instrument to perform such synchronization of the devices' TClk signals. Nowhere does Conway even mention equalizing phase of the trigger clock signals of each of the plurality of devices, nor conditioning driving and/or reception of triggers on trigger enable signals generated from the trigger clock of each of the plurality of devices.

Thus, for at least these reasons, Applicant submits that Conway fails to teach or suggest these features of claim 1.

Thus, for at least the reasons provided above, Applicant submits that Conway fails to teach or suggest all the features and limitations of claim 1, and so claim 1 and those claims dependent therefrom are patentably distinct and non-obvious over the cited art, and are thus allowable.

Claims 19 and 21 include similar limitations as claim 1, and so the above arguments apply with equal force to these claims. Thus, for at least the reasons provided above, Applicant submits that claims 19 and 21, and those claims respectively dependent therefrom, are patentably distinct and non-obvious over the cited art, and are thus allowable.

Removal of the section 102 rejection of claims 1-21 is respectfully requested.

CONCLUSION

In light of the foregoing amendments and remarks, Applicant submits the application is now in condition for allowance, and an early notice to that effect is requested.

If any extensions of time (under 37 C.F.R. § 1.136) are necessary to prevent the above-referenced application(s) from becoming abandoned, Applicant(s) hereby petition for such extensions. The Commissioner is hereby authorized to charge any fees which may be required or credit any overpayment to Meyertons, Hood, Kivlin, Kowert & Goetzel P.C., Deposit Account No. 50-1505/5150-82100/JCH.

Also filed herewith are the following items:

☒ Request for Continued Examination

☐ Other:

Respectfully submitted,

/Jeffrey C. Hood/

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